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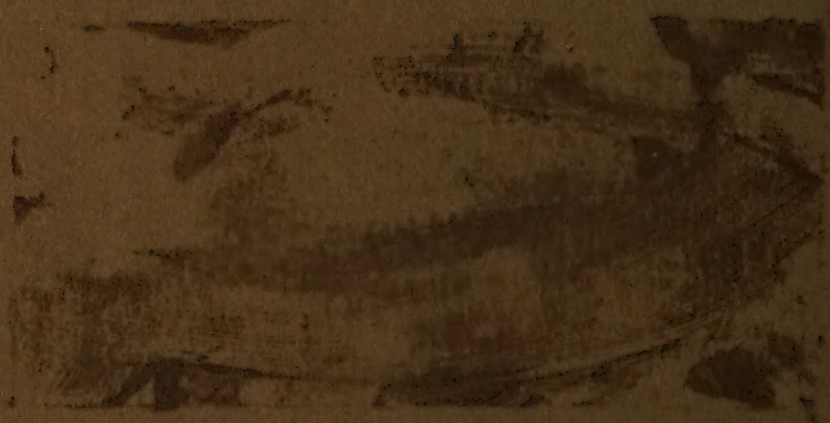
The STORY OF RAYON

THE NEWEST TEXTILE YARN



J. H. Fragonard, Pinxt.

Courtesy Metropolitan Museum

L'Escarpolette

The Story of

RAYON

THE

NEWEST

TEXTILE YARN

Being the
Initial Complete Presentation *of the* Origin
Development and Merits *of this*
Versatile Product

THE VISCOSE COMPANY
171 MADISON AVENUE, NEW YORK

Sales Offices:

ATLANTIC BUILDING
PHILADELPHIA, PA.

HOSPITAL TRUST BUILDING
PROVIDENCE, R. I.

JOHNSON BUILDING
CHARLOTTE, N. C.

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FORE WORD

DOWN *through the ages, almost from the beginning of time, silk, wool, cotton and linen have clothed civilization and decorated its habitations. Century after century has rolled past without enriching the world with a single new fiber, until artificial silk crossed the horizon of the textile world about four decades ago.*

And now, in that remarkably short space of time, rayon (artificial silk) has established a place for itself among these age-old fibers, as one of the five important textiles of the world—a monument to the genius of man.

For rayon is the only textile spun and woven for human needs which man has invented. The origin of the other fibers lies hidden in the mists of antiquity, but the fact suggests itself that in each case it was a natural development. The need was paramount and the wherewith had only to be discovered.

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The pages of this book unfold the fascinating story of artificial silk; how human thought first conceived and then achieved this wonderful new fiber; how it was introduced to the world merely as a substitute, an understudy as it were, but soon blossomed forth on its own merits, a star among textiles.

It has been the privilege of some of the members of The Viscose Company organization to be intimately identified with the introduction and development of artificial silk in the United States. We have watched it grow and improve day by day, and are justly proud of its present high standing as the third largest textile industry of the world.

The Miracle of the Newest Textile

WE salute King Cotton, the universal fiber. The story of its discovery is lost in prehistoric legend, but we know that the cotton pod, the flower of the genus *Gossypium*, or cotton plant, was manufactured into cloth in India fully 3500 years ago.

Wool is of even older origin. History acknowledges the early importance of the sheep in Egypt where the spinning and weaving of wool were known to the ancients, through whom the art was communicated to other peoples.

We pay homage to Linen, the traditional choice of the ancient Egyptians, who brought the art of its spinning and weaving to a very high level and gave it an atmosphere of gentility which has survived through the ages.

And Silk, the queen of fabrics for five thousand years. Silk we know came from China. Ancient Chinese legend takes us back to the days of Fu-hi, the first of "the three Emperors" where a Royal Queen personally tended the silkworms, watched the spinning and weaving of the fiber, and gave it the name of Silk.

But artificial silk—whence came it?

Only a thought in the brain of a man, a persistent, restless little thought that led its master through years of travel,

research and scientific experiment, and brought him finally to the primary living substance, the basis of all living matter —and there a new textile was born.

Taking its very existence from the protoplasm, or living matter of plant life, it has been nursed by the ingenuity and patience of man, and has within the space of a lifetime developed into an industry which now supplies about a hundred million pounds of fiber annually to textile manufacturers.

It is indeed a miracle. A nameless product of almost intangible origin has presented itself and has been accepted on sheer merit by the same world full of people who have accepted the radio and cross country air mail, without understanding, but with confidence—a confidence that expresses itself most graciously in consuming ten times the quantity now that was used ten years ago—a confidence that is premised on the acceptance of this newcomer in the field of textiles, and its intermingling with the fibers of ancient lineage.

For it has been accepted by and interwoven with silk, wool, and cotton for many purposes. It has helped these older members of the textile family, even as they have helped it in its struggle for recognition. And it has attained recognition. It has served its apprenticeship and proved its adaptability.

Artificial silk now has its portfolio. It has been declared one of the five leading textiles of the day, and has taken its place in the public mind, henceforth to be known as "Rayon."

A Worthy Name for a Worthy Product

RAYON has just been christened rayon. Heretofore it has never had a name of its own. It has been struggling under a great variety of misnomers, and, despite this handicap, it has achieved an enviable place for itself among the textiles of the world.

Although unknown four decades ago, it has come into such general use today that it is known the world over as "artificial silk," often abbreviated "art silk"; also as "fiber silk" and its abbreviation "fiber."

These designations are not appropriate, and in most cases not even correct.

Rayon is *not* silk. Its origin and manufacture are as different to silk as silk is to cotton.

Rayon *is* fiber—but so are silk, wool, linen, cotton and every other textile known to man.

That rayon started life without a name is due perhaps to the fact that the ambition of its inventor was to find a substitute for silk. He surpassed himself, and gave to the world a new textile, but the world was not ready to accept it as such. Rayon had to prove its worth, and for this purpose it has been working its way into our lives incognito, as artificial silk.

In this, our newest textile has paralleled the history of cotton, which was introduced to the world as a sort of wool.

Even as late as the Middle Ages, it was commonly conceded that cotton was a wool that grew on trees; today the German name for cotton is *Baumwolle* (meaning tree wool). Its original name, *Kupas*, still survives in India, while in Arabia it was called "*Qutun*," from which is derived the word "Cotton."

And now has come the time for removing the film of ambiguity and confusion that surrounds the newest of textiles. Although it shares some of the features of other textiles, it is a distinctly different fiber with qualities of its own, and it deserves a name of its own, a name that will give it distinction, a generic term that will identify it in the public mind for what it is.

This has been under consideration by various interests for a long time and has been crystallized into action by the recommendation of a committee of manufacturers and artificial silk producers that the word "rayon" be adopted by themselves and suggested to the trade, as the name by which artificial silk shall be henceforth known.

"Rayon" was selected because it is easy to say, pleasant to hear, and expressive. It suggests the sun's rays, and is appropriate for a material on which the sun can smile with the full strength of its warmth and brilliance without disastrous results.

Its steadfastness of color, combined with rare luster and versatility, has found for rayon a legion of uses, which will be discussed in a later chapter.

The Invention and Manufacture of Rayon

FOR five thousand years the little silkworm has been furnishing humanity with its finest raiment. It has plied its trade faithfully and well, and has won for its product a renowned position as the *only* fabric for occasions of moment.

No one had ever questioned the dominion of silk until, perhaps as long as sixty years ago, certain French chemists undertook to duplicate synthetically the results of the silkworm.

This ambition has not been realized, but instead, humanity has been served by the invention of an entirely different fabric, one that has been deemed worthy to associate with silk, and is, in fact, combined with silk in many of the exquisite materials of today.

Even in France the actual invention of artificial silk is somewhat obscure, credit being given to both an internationally known chemist named Reaumur, and to DeChardonnet, who secured the first patent in 1884. In tracing the footsteps of the early research workers whose efforts resulted in this patent, however, we find the real romance of rayon.

The Silkworm's Raw Material

Observation of the fact that the silkworm feeds on cellulose in mulberry and oak leaves led to the rayon industry of today, as the basis of all rayon fiber is cellulose. In attempting to compete with the silkworm, and to duplicate its process, experiments were concentrated on the same ingredient that the silkworm uses—cellulose.

The result, rayon, is like silk in some respects, but has many differing characteristics, due mostly to the fact that the silkworm produces an animal fiber, whereas the cellulose fiber is purely a vegetable product.

The Substance Matter of Plant Life

Cellulose forms the cells which house the protoplasm or living matter of all plants. The size of these cells varies, but in a closely textured plant, the number contained in one cubic inch might exceed the population of the world.

This gives rayon a decided advantage over other textiles, in that it is not dependent on any medium that varies from year to year in the size or quality of its crop. As long as we have plant life, we will have an unlimited supply of cellulose, which makes it possible to stabilize the rayon industry.

It is expected that "rayon" will soon find its way into the dictionary of the English language and its general definition will read something like this:

> **Rayon,** A lustrous textile fiber made by converting pure cellulose into thread formation, by means of chemical and mechanical processes.

There are four processes now in use to greater or less degree in the production of rayon, namely: Nitro-Cellulose,

Cupro-Ammonium, Cellulose Acetate, and Viscose. These differ basically in the solvents and methods used in converting cellulose to liquid form for transforming it into threads or filaments.

The Original Process of Handling

The first of these, Nitro-Cellulose, is the process introduced by DeChardonnet in 1884, in which cellulose from the cotton plant is passed through a nitration process, then dissolved in alcohol and ether, and forced through a glass tube with a very small aperture. This forms a filament that hardens as the alcohol and ether are absorbed or evaporate upon coming in contact with water or air.

The single filaments are then grouped together to form threads of whatever size or denier is required.

This process is very simple, and would be more generally used except for one serious defect. The filament is inflammable and explosive, and is necessarily subjected to a second denitration process, which has not always been effective.

The failure of this denitration process causes unevenness in the dyeing, and if the imperfection is at all marked, it precludes the possibility of even dyeing, either in the yarn or after its manufacture into fabric.

For this reason the volume of production by the Nitro-Cellulose method has not expanded rapidly, and today only about 18% of the world's output is made by this method.

The Second Method Introduced

For fully sixteen years, Nitro-Cellulose was the only known process, but throughout this period, improvements were introduced from time to time, which finally led to the establishment of the Cupro-Ammonium process in 1900.

Credit for this method is attributed to Bronnert, who secured the first patent, but there were so many others seeking a solution of the cellulose problem that a long series of patents resulted about the same time.

In the Cupro-Ammonium process, like its predecessor, some form of cotton cellulose has always been used. The

cotton is first washed and treated to free it from all foreign matter, and then dissolved in Schweitzer's Solution, a solvent prepared by dissolving copper shavings in an ammonium hydrate solution and adding a small amount of caustic soda.

The purified cotton cellulose requires about six hours to dissolve in this solution, after which it must be kept at a temperature under forty-one degrees Fahrenheit. Absolute temperature control has always been one of the principal difficulties in the manufacture of fiber by this process.

Forming or spinning the liquid into threads is quite similar to the Nitro-Cellulose process, although the solution does not coagulate naturally on coming in contact with air or water and must be passed through a solution of sulphuric acid for this purpose.

Only 5% of the world's output of rayon is now made in this way, due to the fact that most manufacturers who formerly used the Cupro-Ammonium process have found it advantageous to install the Viscose method.

The Third and Least Used Process

Cellulose Acetate was the first process discovered and, from a scientific standpoint, the most extensively studied. It did not receive any technical value, however, until 1901, when its recognition was brought about by Cross & Bevan, English chemists.

Theoretically, Cellulose Acetate is prepared by treating cellulose in the form of cotton with acetic anhydride, but in practice the addition of other compounds is necessary.

This solution has been used more extensively for other purposes than for making threads, and produces less than 1% of the rayon now used.

Its principal virtue, and at the same time its greatest handicap, is that it is more or less water-proof and cannot be dyed except by specially prepared formulae.

The Newest and Best Method

The Viscose process, although the newest method known, is now the most extensively used and has overcome many of the difficulties of the former processes.

The first Viscose patent was taken out by Cross & Bevan in Great Britain in 1892, as the result of their scientific research into the chemistry of cellulose. This patent covered the Viscose Solution and was used for making a plastic compound of cellulose. While the solution was known to be suitable for the manufacture of textile fiber, no particular stress was laid on this phase of the subject at that time.

The First Viscose Project

The first practical step in this direction was made by a manufacturer of electric light bulbs in London, who conceived the idea of forming Viscose into a single solid thread, similar to horse hair, and using it as a filament in the electric bulb. The project never reached commercial proportions, mostly because carbon filament was shortly replaced by more advantageous forms.

The undertaking, however, served its purpose in encouraging the use of Viscose for converting cellulose into thread, and this is the medium through which 76% of the world's supply of rayon is made today.

In 1902 an inventor named Topham perfected an apparatus for forming textile fiber from a solution of cellulose, twisting it, and at the same time coiling it into a cylindrical package. This was a radical change from any of the methods then in use, and proved so superior that it is now used almost universally.

In fact, it appears to have supplied the necessary impetus to the growth of rayon as an industry. The manufacture of rayon has grown steadily and rapidly ever since, until in 1923 the world's production reached ninety-seven million pounds.

The rights and patents for the Viscose process were sold separately for each country, and their new owners in almost every instance pushed the project forward as rapidly as possible.

The company that took over the English rights was the first to bring it to a successful issue. The venture in the

The First Viscose Plant

United States met with varying success on a semi-experimental and semi-commercial scale until 1910, when the first plant was constructed solely for the manufacture of rayon by The Viscose Company.

The success of this venture can best be acclaimed by the fact that The Viscose Company is now operating three plants and is supplying 75% of the rayon consumed in the United States.

The Development of the Rayon Industry

IN 1884 a weak, anemic little project was born and would have died, unknown to the world, had it not been for the careful nursing and constant attention bestowed upon it.

Due entirely to the persistent efforts and analytical study of its needs by scientists and chemists, its faint breath of life was nurtured and it gradually but slowly progressed during the first sixteen years of its existence.

With the beginning of the twentieth century, however, it received new vigor through the adoption of new formulae. It was then established as a healthy, normal industry, and has since grown by leaps and bounds, until it is now our third largest textile.

The first ten years of its renewed activity were spent almost entirely abroad where it made great progress, especially in England, France and Germany. During this period rayon was manufactured in the United States on a very limited scale, producing not over fifty thousand pounds a year, and importing upwards of a million pounds.

The Advent of Home Manufacture

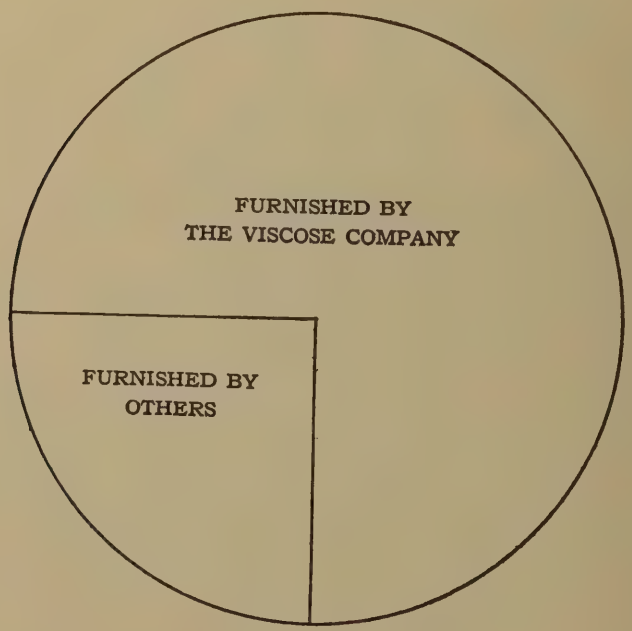
In 1910 construction was started on the first plant in the United States for making rayon products exclusively, and by 1912 this Viscose plant was operating on a productive basis. In that year, the consumption of rayon in the United States was 2,700,000 pounds, of which 59% was imported and the

balance produced here. This record has surpassed itself year after year as shown in the schedule on opposite page, until in 1923, the total consumption in the United States was 39,400,000 pounds, of which only 10% was imported.

Except for the marked decline during the years of the World War, there has been a continued record of progress, and the rapid growth of the past five years much more than offsets the temporary setback of the war period.

The Stimulus of Home Production

It will also be noticed that the quantity of rayon imported year after year has maintained a more or less fixed level, indicating that the phenomenal increase in the consumption of rayon is due largely to the stimulus of home production and its sequel, home manufacture.



The Viscose Company pioneered this movement, and in the twelve years that it has been on a commercially productive basis, it has furnished approximately seventy-five per cent of the rayon consumed in the United States.

United States Production and Importations

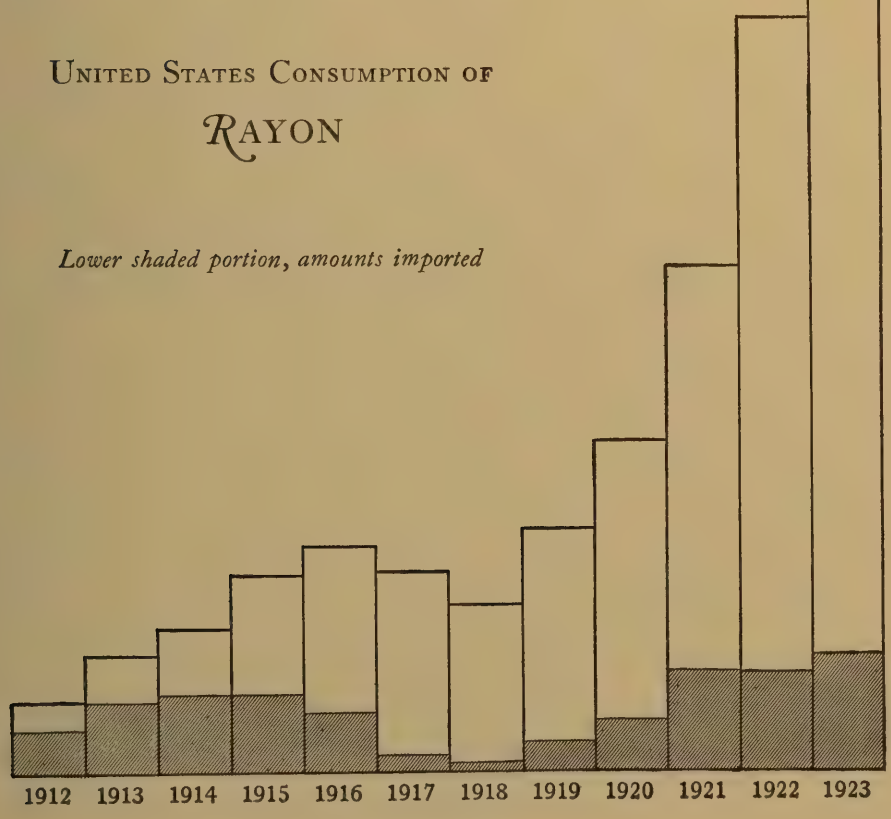
Record of Progress in Home Production

	Pounds Produced in U. S.	Pounds Imported	Total U. S. Consumption	Percentage Produced in U. S.	Percentage Imported
1912	1,100,000	1,600,000	2,700,000	41	59
1913	1,560,000	2,400,000	3,960,000	39	61
1914	2,400,000	2,760,000	5,160,000	47	53
1915	4,100,000	2,780,000	6,880,000	60	40
1916	5,750,000	2,050,000	7,800,000	74	26
1917	6,700,000	500,000	7,200,000	93	7
1918	5,800,000	290,000	6,090,000	95	5
1919	8,180,000	1,150,000	9,330,000	88	12
1920	10,250,000	1,850,000	12,100,000	85	15
1921	15,000,000	3,670,000	18,650,000	80	20
1922	23,500,000	3,650,000	27,150,000	87	13
1923	35,400,000	4,000,000	39,400,000	90	10

UNITED STATES CONSUMPTION OF

RAYON

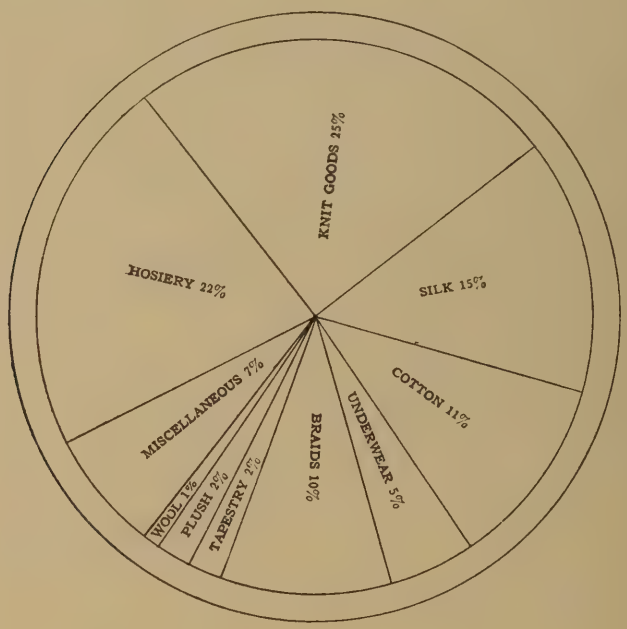
Lower shaded portion, amounts imported



This rapid growth in the output of The Viscose Company was brought about by its effort to keep pace with the constantly growing demand. From the time construction was started on the first building in 1910, there has not been a time when building operations were not under way to further increase the facilities of the company.

New Fields of Usefulness

Rayon was used in this country previous to 1912 chiefly for braids and trimmings, with a limited demand on the part of cotton, silk and sweater manufacturers. In 1912, the industry was stirred to increased activity and experiments led directly to a new channel of usefulness—hosiery.



Almost overnight, hosiery dominated the rayon field and still continues to increase its consumption year by year.

Following the adoption of rayon for hosiery, it quickly gained prominence in other industries. Knit goods is now in the foreground, although silk and cotton manufacturers, two of the first lines to utilize rayon, have kept abreast of the

Growth of Rayon in Various Industries

Pounds Consumed Yearly in the United States

	1912	1913	1914	1915	1916	1917
Hosiery	810,000	1,861,200	2,425,200	4,472,000	4,368,000	3,240,000
Knit	189,000	118,800	154,800	344,000	858,000	1,080,000
Silk	270,000	475,200	619,200	344,000	702,000	1,080,000
Cotton	270,000	554,400	722,400	1,032,000	936,000	936,000
Underwear	.....	.....	.....	.....	.....	.....
Braid	270,000	118,800	154,800	137,600	234,000	288,000
Upholstery goods	81,000	79,200	103,200	137,600	156,000	144,000
Plush	405,000	594,000	774,000	206,400	312,000	216,000
Wool	81,000	79,200	103,200	137,600	78,000	72,000
Miscellaneous	324,000	79,200	103,200	68,800	156,000	144,000
Totals	2,700,000	3,960,000	5,160,000	6,880,000	7,800,000	7,200,000

	1918	1919	1920	1921	1922	1923
Hosiery	2,436,000	2,612,400	3,025,000	4,289,500	6,516,000	8,668,000
Knit	1,035,300	1,586,000	2,541,000	5,408,500	7,059,000	9,850,000
Silk	1,096,200	1,679,400	1,573,000	2,238,000	2,986,500	5,910,000
Cotton	791,700	1,212,900	1,210,000	1,678,500	2,715,000	4,334,000
Underwear	.....	93,300	121,000	373,000	1,086,000	1,970,000
Braids	304,500	1,212,900	1,694,000	1,865,000	2,986,500	3,940,000
Upholstery goods	121,800	186,600	242,000	373,000	543,000	788,000
Plush	121,800	279,900	363,000	186,500	271,500	788,000
Wool	.....	93,300	121,000	186,500	271,500	394,000
Miscellaneous	182,700	373,200	1,210,000	2,051,500	2,715,000	2,758,000
Totals	6,090,000	9,330,000	12,100,000	18,650,000	27,150,000	39,400,000

Total United States Consumption and Percentage Used in Various Lines

Per Cent Used in	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923
Hosiery	30	40	47	65	56	45	40	28	25	23	24	22
Knit	7	5	3	5	11	15	17	17	21	29	26	25
Silk	10	10	12	5	9	15	18	18	13	12	11	15
Cotton	10	12	14	15	12	13	13	13	10	9	10	11
Underwear	..	..	..	..	..	..	..	1	1	2	4	5
Braids	10	5	3	2	3	4	5	13	14	10	11	10
Upholstery goods	3	5	2	2	2	2	2	2	2	2	2	2
Plush	15	15	15	3	4	3	2	3	3	1	1	2
Wool	3	3	2	2	1	1	..	1	1	1	1	1
Miscellaneous	12	5	2	1	2	2	3	4	10	11	10	7

increase in consumption. The schedules on page 19 indicate the yearly growth of rayon in various industries, both on a percentage basis, and actual quantity consumed.

The Best Evidence of Progress

This actual record is perhaps the best evidence of the consistent growth of rayon. It shows that the consumption in 1923 was more than fourteen times that of 1912, and further than this, it shows that there has been a healthy increase every year in each and every industry that has entered into the manufacture of rayon garments.

Underwear is among the newest of the rayon circle of industries and it now holds sixth place. With a record of consumption in 1923 that is more than twenty-one times its own record five years ago, we wonder where it will be five years hence.

The most remarkable growth, however, appears to be in knit goods, which in 1923 amounted to fifty-two times its own record in 1912. It not only towers above other rayon records, but constitutes an amazing development as compared with other textile fabrics in women's wear.

The development of rayon in each separate industry holds much of the material that stories are made of, but space permits only an occasional glimpse into this romance.

The Advent of the Knitted Dress

Looking into the knit-goods houses in 1912, we see mostly sweaters and shawls, or the so-called knitted outerwear, but after years of experimenting, in 1916 we see a knitted fabric make its appearance. It is made of rayon exclusively and is known as tricolette.

We well remember the popularity of tricolette—its almost instantaneous success, and we realize now its far-reaching influence as the pioneer knit dress fabric.

This fabric was of very simple construction as compared with the knitted dress of today, and was hampered by its tendency to stretch and sag in the made-up garment, but it opened the path for knitted dress goods and pointed the way toward their improvement.

The fabric made today fills every demand that is required of dress goods as far as draping and wearing qualities are concerned. Its service now equals that of woven goods, but its range of styles and patterns are more limited.

However, mechanical ingenuity is rapidly overcoming this objection and constantly adding to the number of styles obtainable, which even now permit of a fine selection.

The Problems of Production

In the face of this remarkable record of progress in the industry, it is almost unbelievable that only one manufacturer in six succeeds in establishing his business on a firm footing.

More than twenty-five companies have been organized for producing rayon in the United States during the lifetime of The Viscose Company, of which only four are now on a commercially profitable basis, including The Viscose Company.

There are several reasons for the failure of so many of these companies, to be found mostly within the business itself. In the first place, any process used in the manufacture of rayon must be very delicately controlled as it is distinctly a chemical procedure in which the cellulose solution is undergoing constant changes within itself. In spite of all it is humanly possible to do, there is always the contingency of some unknown factor entering into it and making the solution useless for any purpose whatever.

Such a casualty occurring in a well regulated rayon factory is generally buried on the premises and the outsider never knows of the manufacturer's misfortune.

Even when the cellulose solution produces a chemically proper rayon and, due to improper mechanical equipment and handling, a yarn is made that can be marketed only as C grade, a direct loss of fifty cents a pound results.

Large Capital Required

These difficulties are contributory to the non-financial success of a large number of companies, but the biggest factor is no doubt the large amount of capital required for original construction, installation and carrying charges, until a suffi-

cient quantity of merchantable goods can be marketed to meet expenses.

Persistence of Original Exploiters

A further factor to contend with is that rayon cannot be manufactured at a profit in small quantities, so that the initial undertaking must be on a large scale. It never was and never will be possible to start with the value of a shoestring and wind up with a fortune. Large sums were sunk in this industry before it began to produce and until just a few years ago, the rayon situation paralleled the gold fields of Alaska—more had to be put in than was taken out. In fact, the success of the whole industry today is due to the tenacity of some of the original exploiters who persisted in their undertaking in the face of the most discouraging situations.

The World's Foremost Producers

This refers not only to American enterprises, but to all the principal rayon manufacturers of the world today, who now have in operation seventy-nine factories, located as follows:

United States	9
England	7
Germany	19
Italy	8
France	12
Belgium	4
Switzerland	3
Holland	2
Austria	1
Spain	2
Hungary	1
Japan	5
Poland	1
Sweden	1
Czecho-Slovakia	4
Total	79

This does not indicate the number of organized companies, as many have more than one plant. Three of the nine mills listed for the United States, for instance, are under the control of The Viscose Company.

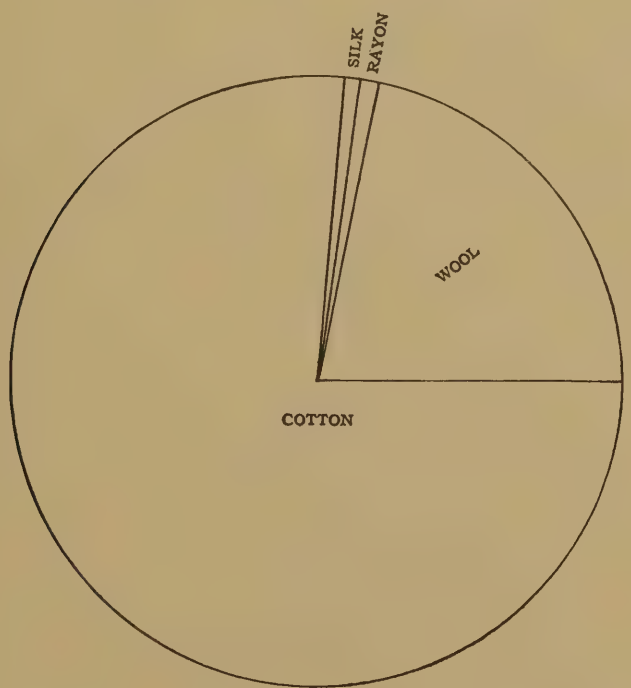
Neither does it take into account companies in the process of organization, nor those already formed but for one reason or another, not producing. As a matter of fact, some of the operating plants listed are still on a partially experimental basis.

The World's Rayon Production

The estimated quantity produced by these mills in 1923 is as follows:

United States	35,400,000
England	16,500,000
Germany	13,000,000
Italy	10,000,000
France	7,700,000
Belgium	6,000,000
Switzerland	3,700,000
Holland	2,600,000
Other Countries	2,100,000
	97,000,000

giving credit to the United States for the production of thirty-six per cent of the world's supply.



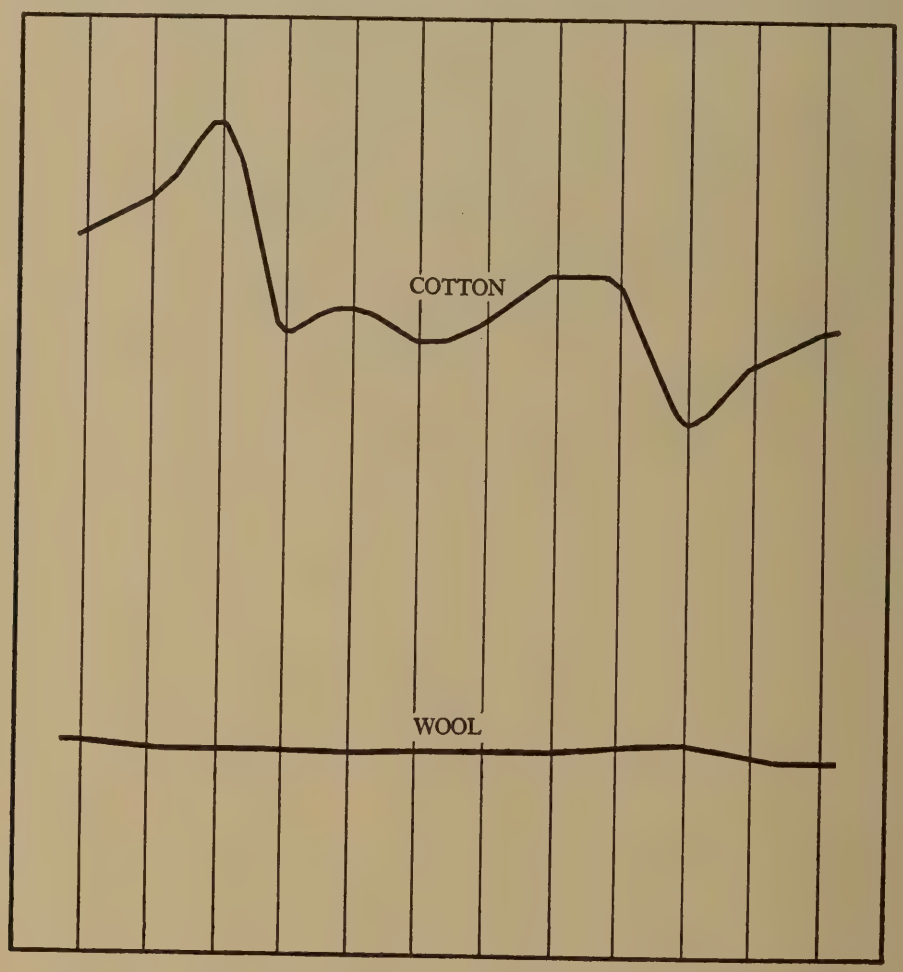
It is also interesting to note the comparative world's production of cotton, wool, silk, and rayon for the year 1923, as follows:

Cotton	9,000,000,000	pounds
Wool	2,600,000,000	"
Rayon	97,000,000	"
Silk	87,000,000	"

The ratio of this production is shown graphically in the chart on page 23, from which it can be seen at a glance that "cotton is king."

The Downward Trend in Cotton and Wool

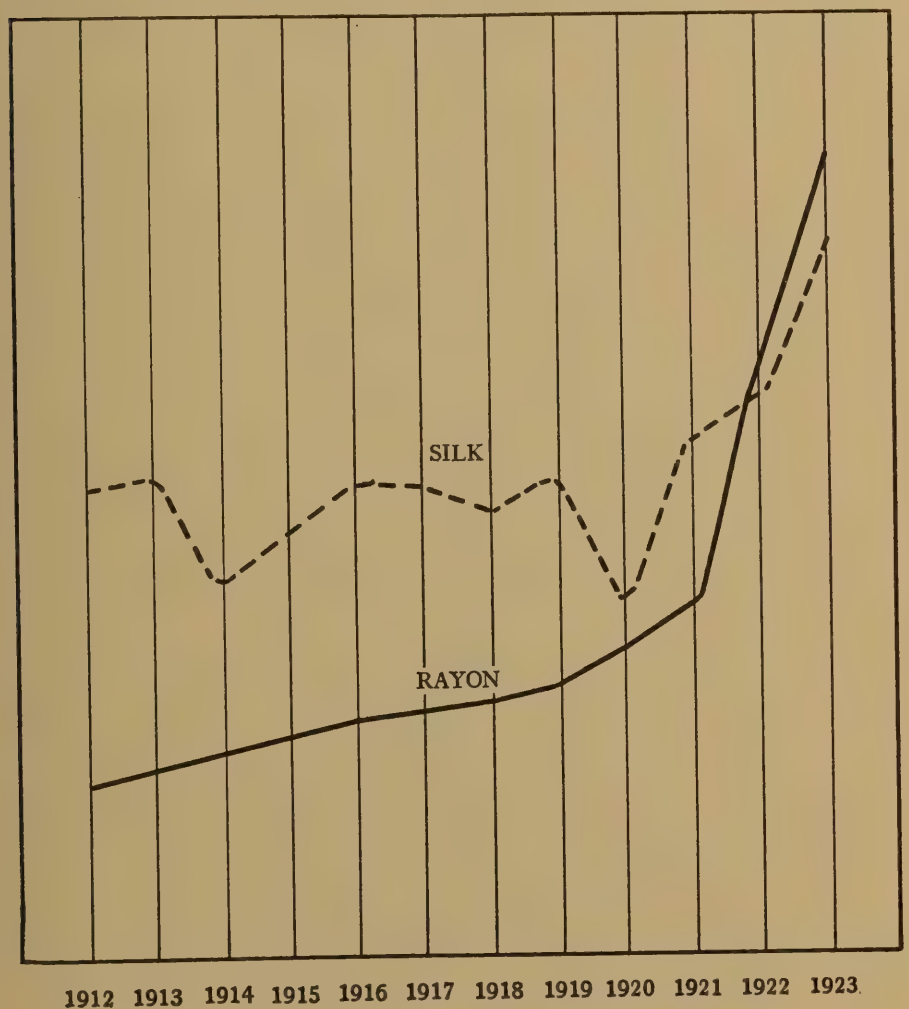
However, cotton is gradually losing ground, as is evident from a glance over production records of the past ten years.



The downward trend shown in the chart on opposite page indicates about three billion pounds less cotton grown in 1923 than in 1913. In other words, the decrease in cotton in this ten-year period represents more than the total amount of wool produced for the year 1923. Wool has also decreased over this period to the extent of two hundred and sixty-seven million pounds, or three times the production of rayon or silk for the year 1923.

The Upward Trend in Silk and Rayon

Silk shows an increase of seventeen million pounds in 1923 over its 1912 record, and in this same period rayon has in-



creased seventy-five million pounds in annual production. This is more impressive when compared to the decline in wool and cotton, and suggests that some glowing statistics could be prepared in anticipating the future of rayon. Certain it is that rayon has not reached and is not approaching its limit of usefulness, and it is the opinion of those most closely in touch with the situation that in spite of its unparalleled rise in a short period of time, rayon has only scratched the surface.

The Steady Increase of Rayon

This is substantiated by the fact that, in addition to its merit as a textile, it is a stable product. When cotton, wool, and silk were all at low ebb in 1920, rayon showed not the slightest weakness in its upward production curve.

This is due to the fact that the other fibers are more dependent on factors beyond human control, and the price at which rayon has been marketed in the United States by the home producers has been subject to less fluctuation. Even during, and shortly after the World War, when prices soared due to curtailed production, the "peak" price for rayon was very moderate as compared with the rise in silk, and the market was at all times more dependable.

The Stability of Rayon

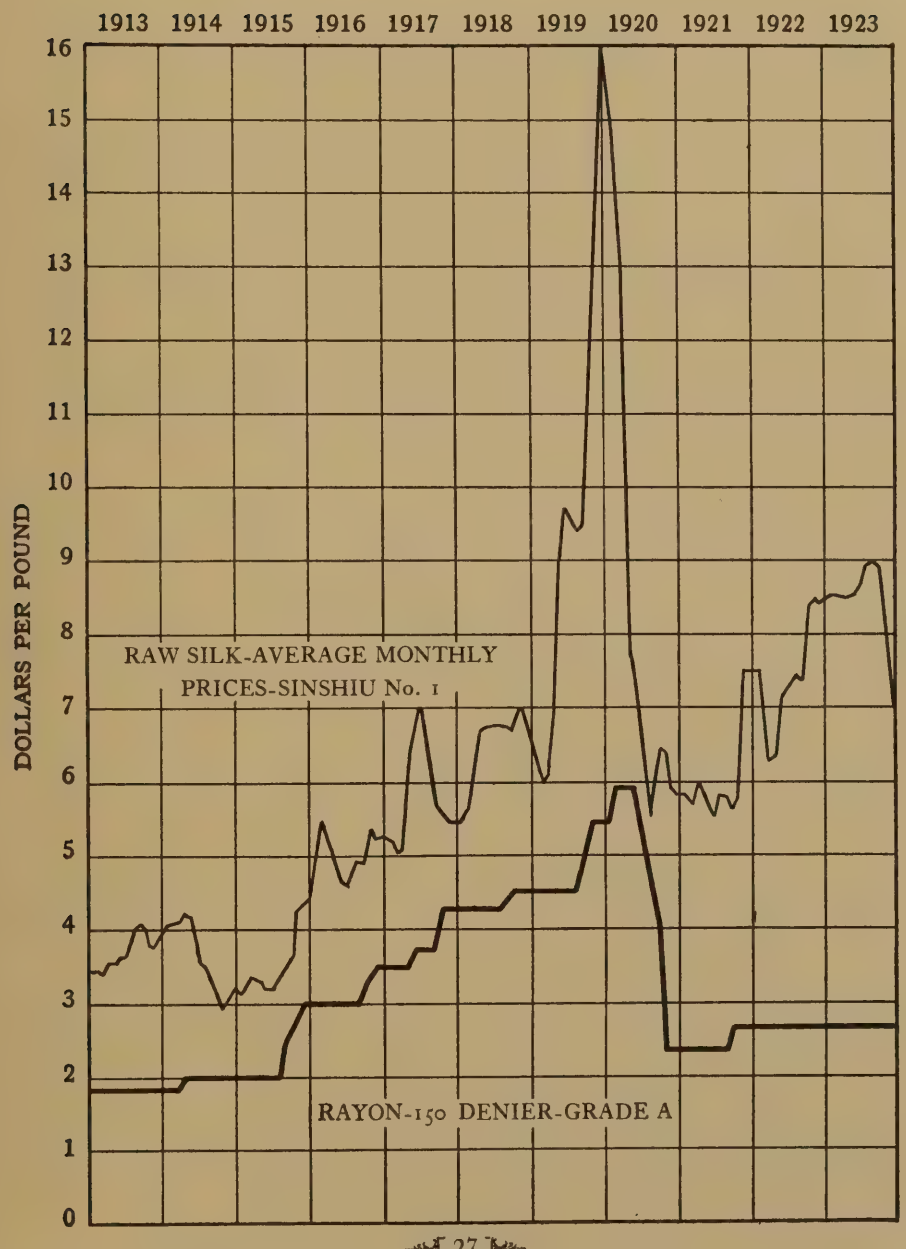
The best grade of rayon was sold by The Viscose Company previous to the war for $1.80 a pound, and the highest price reached during the war period was less than $6.00. In the same period silk advanced from $3.00 to $16.00, in a very unsteady market, as indicated by the peaks and valleys shown in the chart on page 27.

This chart also shows since 1921 rayon held a firm market at $2.75. Early in 1924 it took a further step downward to $2.00, which is about 11% above pre-war prices and, taking into consideration the increased cost of production over 1912, is comparatively the cheapest price at which rayon was ever sold.

In 1924, silk dropped to $5.00 a pound, about the same as in 1920, but even at this low figure it is selling for almost 50% more than in 1912.

RAYON *and Silk Prices*

NEW YORK MARKET



Overcoming Speculation with Rayon

During the war, and the acute shortage thereafter, every effort was made by The Viscose Company to keep rayon out of the hands of speculators. To accomplish this, an attempt was made to limit the price at which it could be resold. The plan worked out satisfactorily in the majority of cases, but it was found that frequently the material passed through several hands. The price to the final consumer often reached twelve or fifteen dollars a pound, or double that charged by The Viscose Company. To prevent this, The Viscose Company sold only to manufacturers who would consume it themselves, with the stipulation that if the manufacturer could not use the quantity purchased, before offering it elsewhere, he would give The Viscose Company opportunity to buy it back.

RAYON · *A Modern Necessity*

THAT rayon has really brought comfort and beauty into the world can best be realized, perhaps, by harking back in memory to the modest home of a generation ago, when a glass-encased dove and sheaf of wheat occupied opposite corners in the parlor and pervaded the room with an air of peace and repose. It will be remembered that the shades were always drawn in the old-fashioned parlor to keep out the sun, and the family "lived" in the other rooms of the house.

Today the "parlor" has been replaced by a living room—a *livable* room that gets its atmosphere of peace and restfulness from luxuriously comfortable furniture, harmonious colorings, soft draperies—and light. Clear, bright daylight, even a ray of sunshine pours in through the silk-like curtains, casting a gleam on the draperies and shedding a glow over the room.

Not that we appreciate sunshine more than did our parents, but draperies and furnishings were subject to perish in a strong light in those days. We owe our present day comfort, then, to rayon—fast dyed rayon that retains its color when exposed to a glare of light.

Rayon in the Home

We may not know in how many ways rayon has been serving in our homes in recent years. We may not realize that rayon is responsible for the wonderful sheen in the velour hangings, for the silken luster in the tapestry covering of the arm-chair, and for the luminous figures in the Chinese scarf on the console. We may not have given thought to the origin of the deep, shimmering fringe and tassel on the lamp shade, nor to the silky-lace curtains gracing our windows. Indeed, rayon has even found its way into rugs, and the most successful pattern ever made was a copy of a very valuable silk prayer rug—and the demand for it was largely from India!

It is sometimes economical to use rayon in lieu of silk, but in the realm of interior decoration, at least, rayon does not depend upon economy for its popularity. Its rare luster, its gorgeous patterns, its steadfast colors, and its beautiful, harmonious cross-dyed effects when combined with other fibers, give it supremacy in this field.

These are the things one seeks when "shopping" for the home. And in any first-class store one is shown velours of rayon; curtains and draperies of rayon; gorgeous tapestries and brocades that combine silk and rayon; alluring patterns that have a surface of rayon with cotton underneath to bind the threads of rayon together.

In plush goods, rayon was first used as a substitute for spun silk, but it gave the fabric a richer, more lustrous appearance and it is now used instead of silk to a great extent in velours and draperies, as well as in other plush materials such as coatings, imitation furs, etc.

Rayon for Personal Use

The newest fabric in the velour family to adopt rayon is velvet; its lustrous surface will soon vie with silk velvet in seeking public favor, not only for decorative purposes but for wearing apparel.

And why not? We are wearing rayon now in so many forms! Silk manufacturers are using it in dress goods for street, afternoon and evening wear, as well as for sport wear, linings, shirtings, tie silks, ribbons, etc. In fact, conditions in the silk industry are about the best indication of the true position of rayon as compared with other textiles. The quantity of this fiber used by silk manufacturers in the United States is now twenty-four times that of 1912, and during that time the consumption of silk itself has steadily increased.

Silk and Rayon

It is not difficult to account for this. Silk and rayon combine so well that many of the most desirable materials used today come of this union. Rayon is a vegetable fiber, while silk is of the animal family; this permits of an unlimited array of beautiful cross-dyed effects in addition to self-tone stripes and patterns, brocades, etc.

Wool and Rayon

In woolen goods, rayon is frequently seen in the form of fine-line stripes in woven suitings. Knitted dress goods are usually made of rayon, and in knitting ties, scarfs, shawls, caps, sweaters, etc., rayon is often combined with wool as a decorative feature. Wool, like silk, is an animal fiber and permits of many cross-dyed effects.

Cotton and Rayon

It has been found that rayon also enhances the appearance and saleability of cotton goods without greatly increasing the cost and, in the higher grades of these materials, practically the same proportions of rayon and cotton are now used.

The high luster of the rayon lends a silk-and-cotton effect, and it is superior to silk for this purpose. Cotton and rayon submit to the same treatment in dyeing, so that decorative effects in rayon with a cotton foundation are necessarily self-colored, but very effective nevertheless.

Not only in outer wearing apparel but also in accessories and underwear, rayon has established a firm footing.

Dress Accessories and Underwear

Women's gloves are now made of a rayon fabric, and in braid, millinery ribbons and trimmings there is hardly a fabric made that does not contain rayon. Ribbon straw or visca as well as imitation horsehair made of rayon is used extensively by millinery braid manufacturers.

Rayon is also used for embroidery trimming on dresses, as well as for embroidery floss, fringes, laces, elastic braid for garters and arm bands, etc.

It is combined with silk, wool, and cotton in women's, men's, children's and infants' hosiery, and a large percentage of men's and women's hosiery is made entirely of rayon, except for tops and feet which are reenforced with cotton.

Underwear is the most recent and most rapidly developing line of usefulness for rayon. In recent years it has been used largely in women's garments and is now being introduced for men. The fabric for this purpose is usually all rayon, very finely knit and proof against runs.

Rayon has found many other fields of usefulness in miscellaneous products, among which might be mentioned webbing, elastic hosiery, bandages, shoe-top cloth, electric wire covering, gas tube covering and gas mantles.

In many of these miscellaneous lines rayon has replaced the textile formerly used, either because of a more pleasing appearance, or because it afforded a reduction in cost.

The Test of Purity

The employment of rayon in the making of gas mantles, however, was not because of cheapness nor because of appearance, but was due to cold, hard, scientific facts—the result of technical investigations.

Cotton or flax was formerly used in the making of mantles. The process consists of knitting the material into tubular form and then saturating it with metal salts. The textile merely acts as a form to hold the salts, and when the mantle is fired

this textile is consumed, leaving a tube composed only of metallic salts. Any ash that appears in the firing of the mantle, is direct evidence of impurities.

Rayon burns with a smaller amount of ash than either cotton or flax and, from this as well as other tests, it has been demonstrated that rayon is one of the purest commercial forms of cellulose known.

Chief Factors in the Marketing of Rayon

IT would require quite a volume to record every operation in the development of rayon, beginning with the extraction of cellulose from plant life, and carrying the story along to the final sale of a finished rayon garment. The responsibility of The Viscose Company ceases with the first section of this story, the delivery of rayon fiber to the fabric manufacturer, but that merely forms the foundation of the story and would not in itself make a "best seller," such as rayon has proved to be.

We know that we are dependent upon the activities of the fabric and garment manufacturers, even as they are dependent upon The Viscose Company, and that the success of each spells the success of the other. Further than this, we are all dependent upon that group of workers known as dyers and finishers who hold in a firm grasp the fate of our efforts, and we

proclaim this one of the chief factors, perhaps *the* chief factor because the most problematical, in the marketing of rayon.

The Proper Dyeing of Rayon of Great Importance

The nature of rayon is that of a vegetable fiber, the same as cotton or flax, and opposed to animal fibers such as silk and wool. It is common knowledge that the dyes and chemicals used in dyeing, bleaching and finishing are distinctly different for the two classes, and that a chemical treatment which would produce a desired result on one would greatly harm or entirely destroy the other.

The chemistry of dyeing is a highly technical subject and, with the present wide use of rayon, the demand has created a large number of establishments that make a specialty of dyeing rayon either in skeins or after its manufacture into piece goods.

Generally speaking, rayon requires the same kind of dyestuffs and chemical treatment as cotton, and the process is more or less simple when handling rayon in skeins, or in materials made solely of rayon.

A large quantity of rayon, however, is manufactured into material in combination with silk and wool and dyed in the piece. Such materials require more specialized handling in the dyeing, as a combination or union dye must be used which will meet the requirements of both fibers, unless a cross-dyed effect is sought. In that case, two separate dye baths are required, one for the vegetable and one for the animal fibers.

The Proper Care of Rayon is Essential

Now, it rests with the garment manufacturers to produce desirable garments, and it behooves manufacturers and dealers to inform the purchaser of a garment as to its proper care.

The satisfaction of the customer depends upon the service of the garment, and its service depends upon its treatment, especially in laundering.

The limitations of silk and wool are well known, but due to the exceedingly short time it has been in use, the characteristics of rayon are not so well understood.

All rayon used in the manufacture of fabrics has been produced along very careful lines, the result of years of experience and research, but this does not mean that the natural limitations of the fiber have been changed or that no further consideration need be given to its use and care.

No Water Too Hot or Too Cold for Rayon

In the first place, rayon does not have the same water-resisting qualities as silk, wool and cotton, and if it is subjected to any undue strains while wet, the threads are in danger of being torn apart. It should be thoroughly understood that water at any degree of temperature from ice-cold to boiling hot has no permanent deteriorating effect on rayon, particularly on Viscose rayon, so that when it is again dry, rayon regains its full original strength, but *it must be carefully handled while still wet.*

This weakness is evident in garments made entirely of rayon, but is overcome in fabrics that combine rayon with silk, wool, or cotton.

Most of the trouble in connection with the cleansing of rayon fabrics occurs in commercial laundries rather than in the home, due to the fact that little or no discrimination is given to the different fabrics handled.

In some commercial laundries, as a time and labor-saving device, a strong bleaching compound is used, generally prepared from chloride of lime; and in order to remove its final traces, the fabric is treated with an acid solution.

Rayon Will Not Turn Yellow

This treatment is extremely detrimental both to silk and wool. If the bleaching compounds are too strong, or if the fabric is left in too long, it is very weakening and harmful to rayon, but rayon has one advantage over silk, in that *it will not turn yellow.* In fact, it will not lose its whiteness or luster even with age, and regardless of treatment.

There should be no difficulty in washing hosiery, knitted dresses or other rayon garments if they are not pulled while wet. In the drying of knitted rayon garments, it is better to spread

them out on some flat surface instead of hanging on a line, as the water in a hanging garment collects at the lowest point and tends to cause a stretching of the partially dry portions.

Rayon Should Be Handled Gently

Rayon should not be subjected to a scrubbing board treatment, or undue pulling or stretching.

It will better withstand labor-saving, dirt-removing washing compounds than will either silk or wool, should not be subjected to treatment that is not ordinarily given these fabrics.

If the same care were always exercised in washing rayon that is used in the handling of silk, no trouble would ever be experienced. Soaps or washing compounds suitable for silk or wool fabrics are equally suitable for rayon.

Gasoline or any of the well-known compounds used for dry cleaning fine fabrics will generally produce the desired result and cause no injury to rayon.

It is well to know also that rayon will take starch, as will cotton, without any injurious effect.

In the ironing of washed fabrics, particularly where rayon alone is used, it is wise to press the material under a slightly dampened cloth. If the iron is used directly on the goods it will not cause any permanent damage, but is likely to give a peculiar shiny appearance, such as the impress of an iron on worsted or woolen goods.

Curtains made from rayon can be washed easily and safely, and as nearly all curtains and draperies are dyed fast to light, there is no danger of disturbing the color. Curtains and draperies are sometimes inclined to shrink slightly after hanging at an open window during a heavy fog or rain. This causes a crinkled appearance in places, which readily presses out with a hot iron, and the original semblance is restored.

Proof of Wearing Qualities of Rayon

As to the wearing qualities of rayon, the examination of men's cotton and rayon striped shirts revealed that when the cotton had worn away entirely on the edges of the cuffs, the threads of rayon remained intact.

But the best proof is contained in two tests, separately conducted, one by a large and prominent manufacturer of a nationally advertised line of men's underwear, and the other by a manufacturer equally prominent in the women's line.

Results of Actual Tests

In the men's wear, garments made entirely of rayon were tested in conjunction with high grade cotton garments. They were worn during the test for golfing and were subjected to successive washings in the home laundry. The results showed rayon to be entirely unaffected by perspiration or by washing, and in fact, to be on a par with the cotton underwear in point of service.

With the women's underwear made from rayon, the experiment was tried in conjunction with a garment made from pure silk. In this case, of course, neither silk nor rayon were subjected to the same severe usage as in the test with cotton, and the final results showed the rayon still intact after the silk garment had started to go to pieces.

The Viscose Method

IT IS fascinating to watch a machine, almost any machine, turn out its product with rapidity and precision, and in the manufacture of rayon a mysterious element is injected that is nothing short of entrancing.

Picture a vat full of a liquid substance and then imagine, if you can, this liquid flowing through a number of closely associated, minute holes, each separate little stream becoming suddenly transformed as if by an unseen power, to constitute one strand in a thread. It is as though one could pick up the many little water spouts that gush from a needle-bath spray and twist them into a solid substance.

For the purpose of better understanding, let us take a journey, in print, through one of The Viscose Company's plants, and become acquainted with the preliminary processes that are necessary to produce this marvelous rayon product.

Transforming Cellulose to Viscose

In the manufacture of rayon there are seven distinct steps between the preparation of the cellulose and the final packing of the finished yarn. These seven major steps are as follows:

1. Making and purifying cotton or wood pulp for cellulose base.
2. Mercerizing, consisting of caustic soda treatment, forming alkali cellulose.
3. Treatment of alkali cellulose with carbon bisulphide, forming cellulose xanthate.
4. Mixing of cellulose xanthate with caustic soda liquid to form cellulose solution.
5. Spinning cellulose solution into threads.
6. Reeling threads into skeins and finishing.
7. Preparation of skeins for textile mills.

The Viscose process is the only method used in the manufacture of rayon in which forms of cellulose other than cotton can be used. The Viscose Company uses spruce sulphite wood pulp and pulp manufactured from cotton, and the method of procedure is the same with either.

Reducing Cellulose to Pulp

The raw stock in the form of spruce-wood or cotton is cooked by the aid of live steam, in a large boiler called a digester. This cooking, with the assistance of chemicals, removes resin, gums and foreign matter from the natural cellulose.

After leaving the digester, this mass is thoroughly washed to free it from all chemicals, and then bleached to bring it to a proper degree of whiteness.

The cellulose now consists of minute short fibers which are run through a series of rolls to squeeze out the water. This compresses the fibers into sheets of about the thickness and consistency of blotting paper. The whole general procedure in preparing the cellulose sheets is similar to that used in pulp and paper making, but the chemical formulas used for the manufacture of rayon produce a much purer form of cellulose.

Mercerizing the Pulp

For mercerizing, these large sheets are cut to twelve-inch squares and soaked in a solution of caustic soda for about twenty-two hours. The excess liquor is then forced out by hydraulic presses, and the sheets are torn into small particles by revolving knives and kept in especially constructed containers, at an even temperature, for about forty-eight hours.

Cellulose Xanthate

This product, now called alkali cellulose, is placed in a revolving churn with a measured amount of carbon bisulphide, and the mixture is slowly revolved for two to three hours, forming the cellulose xanthate. This is a plastic substance, light orange in color, and can readily be dissolved in water.

Mixing to a Uniform Mass

The cellulose xanthate, with a weak solution of caustic soda, is placed in a machine with rapidly revolving blades, which thoroughly beat and mix it into one uniform mass. This

operation, called the mixing, is the final process in converting the cellulose to the liquid form called "Viscose."

The word "Viscose" is now listed in the standard dictionaries. It was derived from the word "viscous", meaning adhesive and glutinous, and is a correct designation of the Viscose Solution, which closely resembles molasses in color and consistency.

Ageing the Viscose Solution

The solution, after mixing, is in an immature state and before it can be spun into threads, it must be aged by standing in large vats or tanks at an even temperature. Before leaving the ageing cellars for the spinning room, it must be very carefully filtered to remove all dirt or foreign matter accumulated during the manufacture in, and transfer from, the different departments.

So far, there is nothing to indicate that these various processes lead to the production of a textile fiber. In fact, the actual spinning into threads is the first visible step.

The Secret of Converting Liquid into Thread

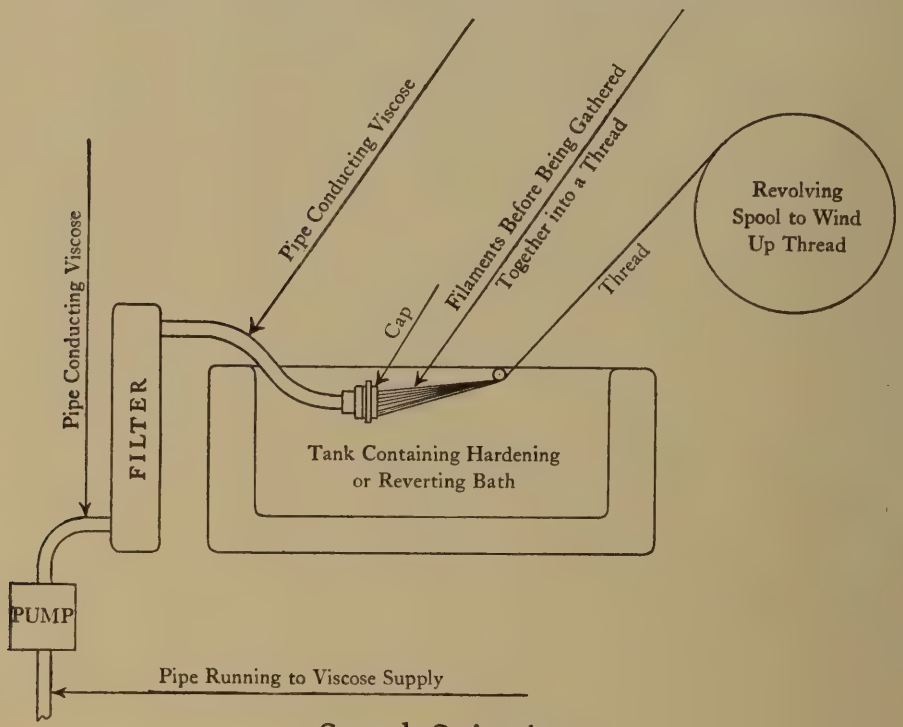
The secret of forming the filaments of thread is that the Viscose Solution is strongly alkali and hardens upon coming in contact with acid, thus reverting the cellulose to a solid form by neutralizing the alkali.

The mechanical part of the operation, simply stated, consists of forcing the Viscose through a plate containing fourteen or more holes, which is immersed in an acid bath. The Viscose, on leaving the plate, is immediately hardened or reverted by the acid and drawn away from the plate before it has time to merge or run together again.

The holes in the plate or cap through which the liquid is forced are from two to five one-thousandths of an inch in diameter and, in fact, are invisible to the naked eye unless held before a strong light. A very small speck of dirt or foreign matter would be sufficient to close one of these holes and immediately reduce the number of filaments entering into the make-up of the thread.

The Process of Producing Finished Yarn

The Viscose is conveyed in pipes from the ageing cellar to the spinning room, first being fed to a pump which forces an exact amount per minute through a filter; then through the cap and into the reverting bath where the filaments are hardened.



Spool Spinning

If the mercerizing, or first process, is started with a hundred pounds of dry cellulose it would theoretically make an equal amount of rayon. The addition of water and caustic soda in the various operations might bring the total weight of the completed Viscose solution to a thousand pounds, containing nine hundred pounds of chemicals and water. This excess matter must all be removed after the solution is hardened before the yarn can be called finished.

The counts or sizes of all yarns are based on the number of yards to a pound, and rayon is no exception.

If, for instance, it was desired to spin a thread having ten thousand yards to a pound, the pump would have to force

ten pounds of Viscose Solution, containing one pound of cellulose, through the cap in a hundred minutes.

If the revolving spool was one yard in circumference, it would necessarily make ten thousand revolutions in the course of the hundred minutes, winding upon itself the pound of cellulose contained in the reverted Viscose thread, which would be uniformly distributed through the ten thousand yards.

There are two general methods used in spinning, called the spool method and the box method, which are identical to the point of immersing Viscose solution in the hardening bath.

Spool Spinning

From this point the methods are radically different. In the first case, as shown in chart on page 42, the filaments are grouped together to make up the thread and immediately wound on a spool which revolves at a regulated number of revolutions per minute.

The thread as wound is made up of parallel filaments in a semi-gelatinous state, requiring further hardening by chemical treatment, followed by a thorough washing to remove all traces of chemicals, after which it is finally dried.

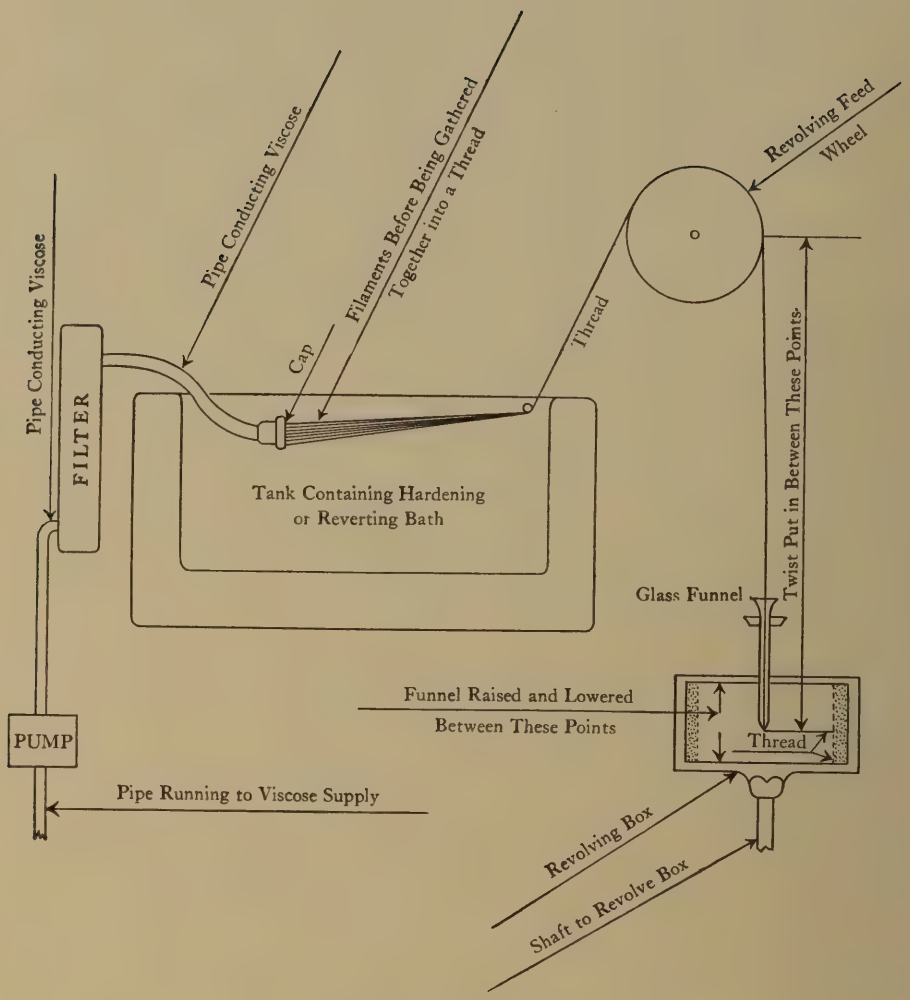
All this chemical treatment, wet finishing and drying is done while the thread is still on spools in separate filaments. The filaments are somewhat delicate and fragile, but when grouped and slightly twisted together, they form a very substantial thread. The same condition exists in a thread of silk.

The twisting operation consists of unwinding the filaments and, by the aid of a rapidly revolving spindle, putting in the desired twist while winding on another spool. It is then reeled from the second spool into the form of skeins.

Box Spinning

In the second, or box spinning method the separate twisting operation is eliminated.

The filament, on leaving the cap, passes over a revolving wheel or pulley and drops through a glass funnel into a rapidly revolving pot or cylinder called a box. Between the point where the filament leaves the pulley and the lower end of the



Box Spinning

funnel, located in the center of the box, moves slowly up and down, distributing the thread evenly, and the centrifugal force of the revolving box throws it to the sides in a smooth coil.

Applying to this operation the problem previously cited, if the box revolved at the rate of five thousand revolutions per minute, the hundred yards or thirty-six hundred inches would have a total of five thousand turns, or slightly less than one and a half turns per inch. When removed from the box, it is in the shape of a hollow cylinder about an inch thick, the

outside diameter and height corresponding to the inside measurements of the box.

This package of thread is now ready to be wound or reeled into skeins, the standard rayon skein being forty-four inches in circumference. All further finishing treatment, such as washing and drying, is done with the yarn in the skein form.

Finishing Processes

In the box method of spinning, the skeins are dried under a slight stretch or tension, but this is not necessary in the spool method, because the thread dries and contracts on the spool.

After the final washing and drying, the cellulose is back in the original pure, dry state in which it entered the first or mercerizing step of conversion, only instead of being in the shape of a sheet like blotting paper, it is in the form of a brilliant, lustrous thread, called rayon.

During the different steps of manufacture, due to various causes in which the human element is a large factor, defects develop such as broken or lost filaments, or the bunching together of filaments in so-called nests or slubs.

These imperfections may be caused by one or more of the holes in the cap becoming clogged, or by the thread coming in contact with some rough surface during any of the subsequent operations.

Sorting and Grading

To segregate the material containing these defects, each skein is looked over carefully in the sorting or grading department, and placed in one of three standard grades, classed as "A" grade, "B" grade and "C" grade.

No commercial quantity of rayon, nor in fact any other textile thread, has ever been made absolutely perfect, but rayon "A" grade is as free from defects as it is possible to detect by the employment of the best talent obtainable.

The "B" grade contains a limited amount of these broken or missing filaments and slubs, and the "C" grade has them to a greater extent. It must be understood, however, that

these faults are all of a mechanical nature and do not in any way interfere with the dyeing qualities or luster of the yarn.

Where the yarn has to be transferred to special packages, such as quills or cones, these imperfections can be removed by the aid of mechanical attachments on the winding machines, and the product put through this operation will fill every requirement of a higher grade. Of course, this increases the cost of handling and slows down production somewhat. These factors are taken into consideration in pricing lower grades, so that there is a slight advantage to the purchaser provided his equipment is arranged to handle them.

The "A" grade is by far the largest proportion of the output, and the Utopia of every rayon manufacturer is a perfectly running factory producing nothing but "A" grade.

Specially Made Threads

In addition to the regular rayon thread, special threads or filaments can be made from the Viscose Solution of cellulose. Visca ribbon straw and a great quantity of horsehair used in women's hats are composed of rayon.

The ribbon straw, as the name suggests, is a thin flat material, generally made from one-eighth to one-quarter of an inch wide, and the horsehair is a round thread about the thickness of genuine horsehair.

These products are in nearly all instances produced by the spool method. The only change in the regular process is that instead of having a number of small holes, the cap used has only one larger round hole for forming the horsehair, or a slit for the ribbon straw.

In some instances a heavy, coarse count of yarn is required for tassels, fringes, and other purposes, but this does not require special shaping. It is usually obtained by twisting several of the regular rayon threads together.

Manufacturing processes sometimes require the yarn in forms other than skeins, but all rayon is produced in skeins first and then transferred to other forms. For instance, for

Specially Packed Threads

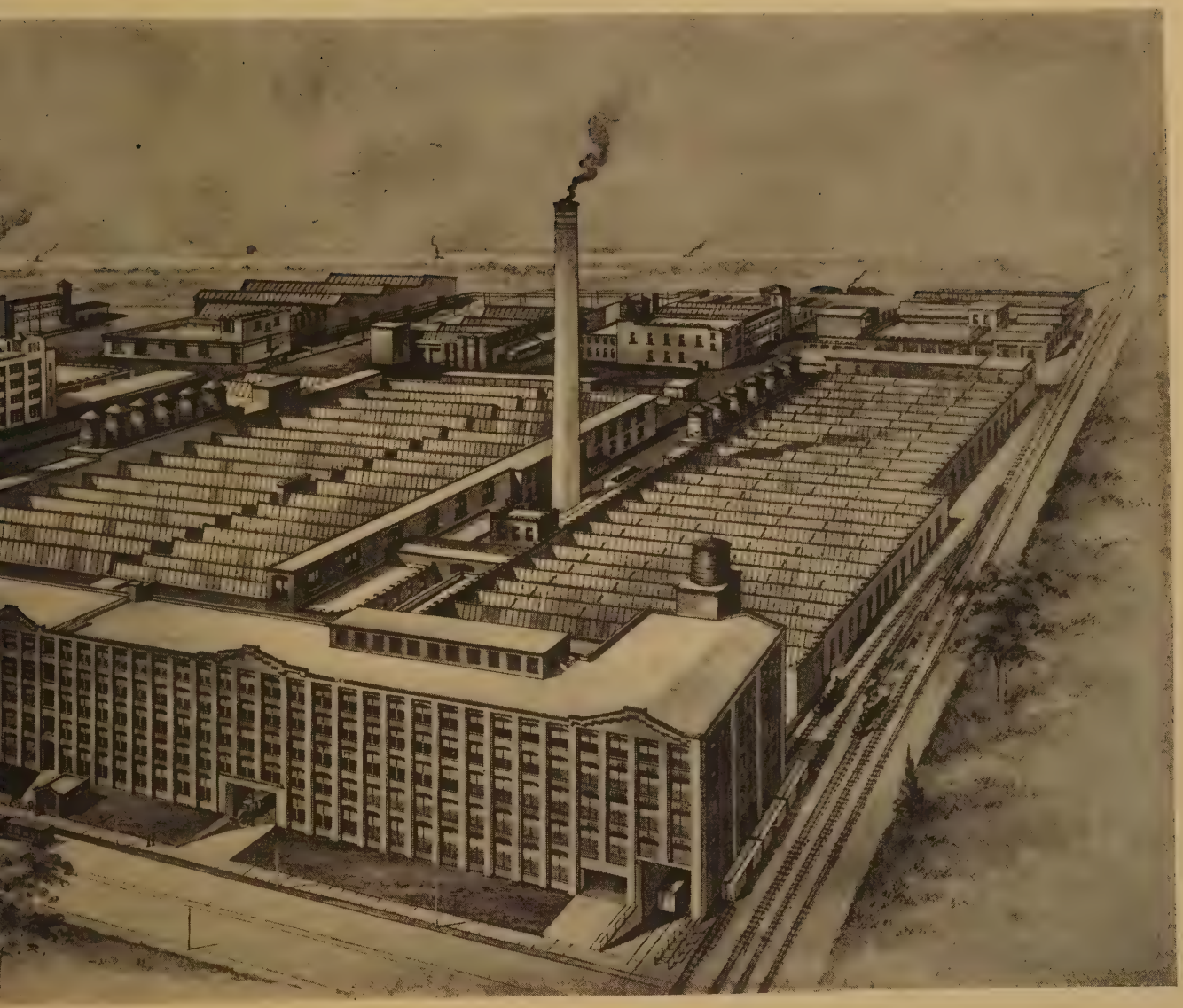
hosiery, sweater and knit goods manufacturing, the thread must be on a cone, or bottle bobbin. The weaver must have a cop or quill for the weft and beams for the warp, and sizing is quite often necessary.

The reader who is interested in the winding, copping, warping, sizing, or weaving of rayon is invited to write to The Viscose Company for a copy of a pamphlet entitled "Methods of Handling Artificial Silk," which describes these operations in detail, and is distributed by the company without charge.

So much might be said of the many phases of the rayon industry that it has been impossible to give more than a general idea of the subject in this book. To our knowledge, this is the first attempt that has ever been made to tell the story of artificial silk; the various chapters could be elaborated upon, giving more technical data as well as more practical uses of rayon, but it will fulfill its mission, we hope, in creating a better understanding and appreciation of the origin, manufacture, adaptability and serviceability of rayon—the newest, the most versatile, and one of the most widely used textiles now on the market.

MARCUS HO

A plant of
THE VISCOSE COMPANY
where
Rayon
is manufactured



ENNSYLVANIA

The following pages afford a glimpse inside this plant and an idea of some of the many intricate operations required in the transformation of this newest textile.

Offices and administration building

Finished yarn department building

Section of storeroom showing purified pulp in sheets, ready for conversion into viscose

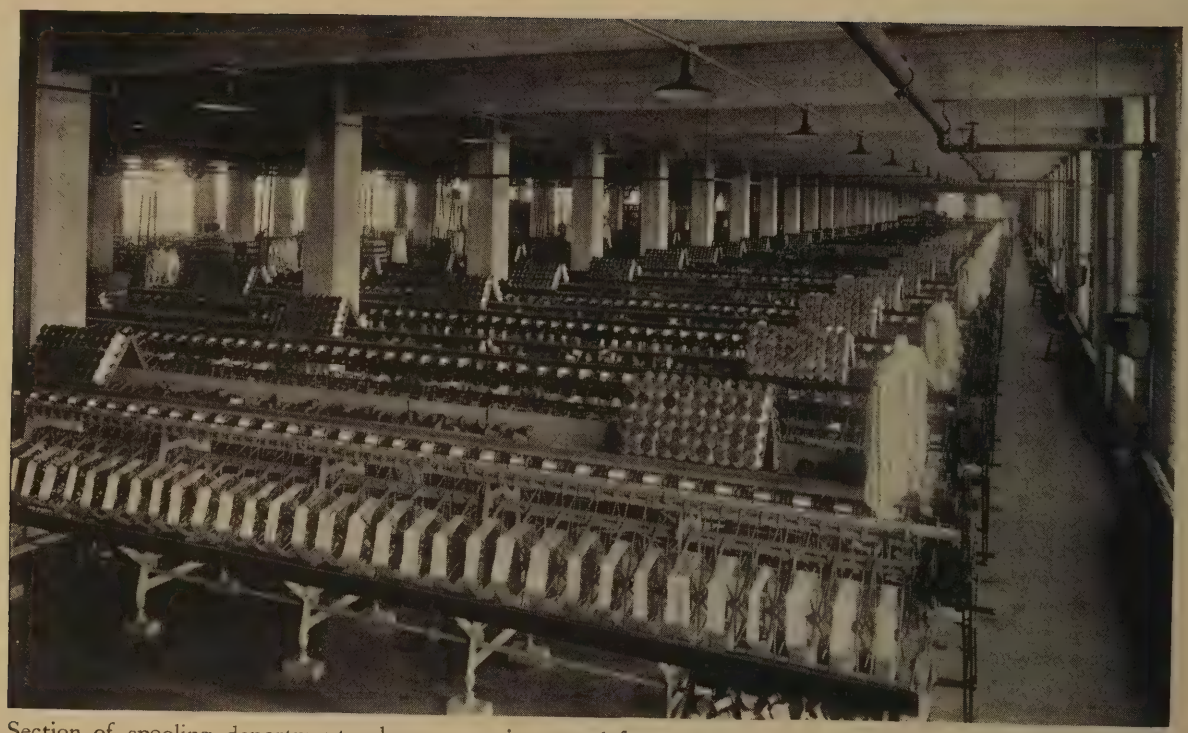
Section of chemical laboratory where formulas are prepared for converting cellulose into viscose

Section of spinning department showing ends of machines, and steps to each separate spinning machine aisle

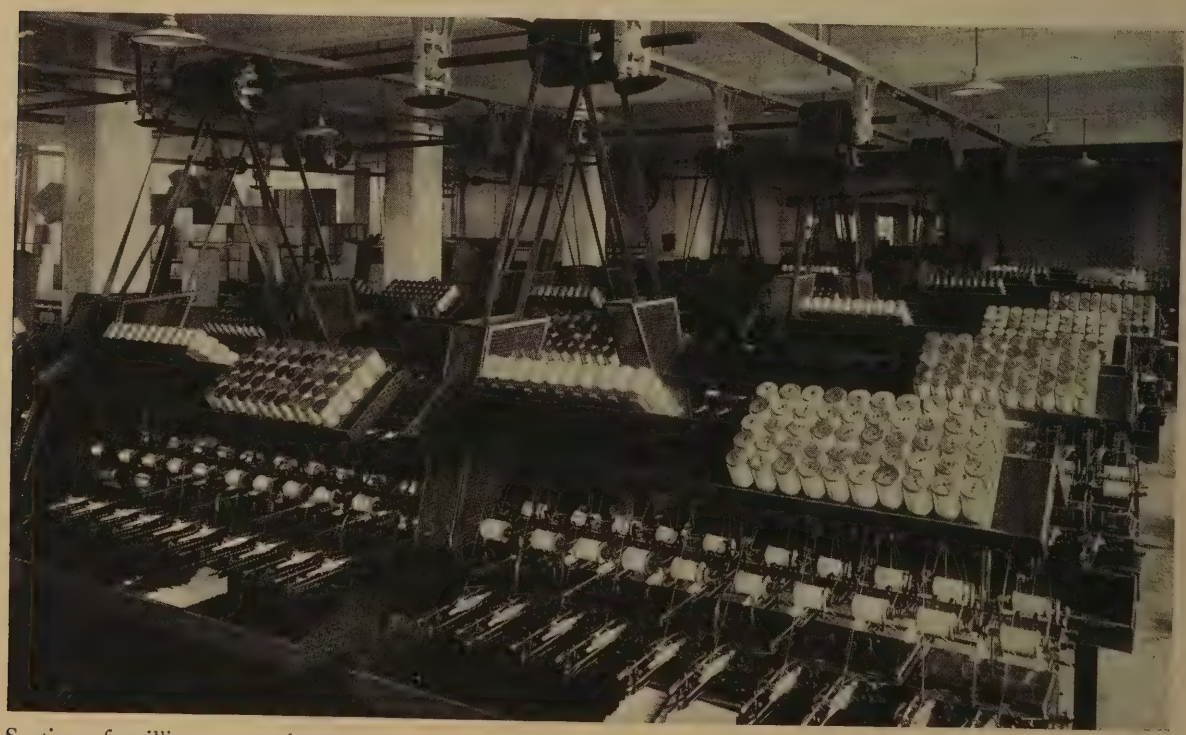
A glimpse into one of the aisles, showing two facing machines wherein viscose is spun into rayon

Section of reeling department where rayon is first put into skeins

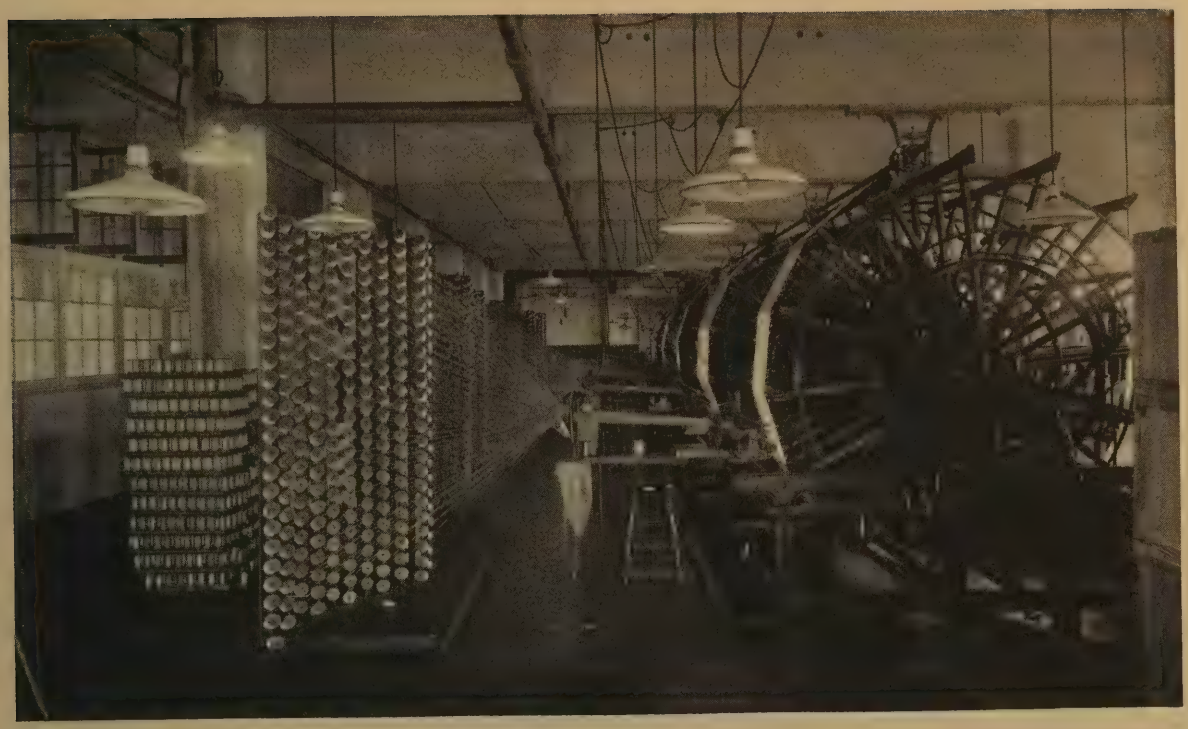
Section of sorting department where rayon skeins are inspected and graded



Section of spooling department where rayon is wound from skeins to spools for transferring to other forms



Section of quilling or copping department where rayon is transferred from spools to the form needed for the weft in weaving



Sections of warping department showing processes through which rayon passes before it is ready for the warp of the weaver's loom

Section of girls' dining room

Interesting Points in the Production of Rayon

WHAT IT IS AND HOW IT IS MADE

RAYON is a vegetable fiber, made by transforming cellulose into filaments by means of chemical and mechanical processes (page 10).

Cellulose is the substance on which the silk worm feeds, and is therefore the basis of pure thread silk.

Hence, silk and rayon are made of the same substance, but the silk worm produces an animal fiber whereas the chemical treatment produces a vegetable fiber (page 10).

Cellulose is the protoplasm or living matter of plant life. In a closely textured plant, in one cubic inch, these cells might exceed the population of the world.

As long as we have plant life, we will have cellulose. Rayon is therefore not dependent upon crops or seasons and is the most stable fiber on the market today (page 26).

Rayon is the purest form of commercial cellulose (page 32). Practically no other ingredient is present in the finished rayon fiber (page 42).

Cellulose in its purest form is converted to thread by reducing it to a liquid, through delicately controlled chemical processes, and then shaping the solution to the form of fiber filaments and extracting the chemicals (page 41).

These filaments, twisted together, form rayon thread. The weight of the thread is controlled by the number of filaments included, and by the speed at which it is reeled from the converting bath (page 43).

Before delivery to the fabric or garment manufacturer, the rayon thread undergoes various finishing processes, and is then reeled into skeins, sorted and graded (page 45).

Heavy yarns for tassels, fringes, etc., are made by twisting together a number of rayon threads. Other forms of rayon are the specially shaped horsehair and ribbon straws (page 46).

Interesting Points in the Serviceability of Rayon

ITS WEARING AND WASHING QUALITIES

THE wearing qualities of rayon are equal to any other material of an equal grade, used in like manner.

A good grade of rayon garment will outlast a silk garment when given the same wear and the same care. Likewise, a rayon garment will withstand the wear given to the average cotton garment of good grade (see tests, page 38).

The purchaser of a rayon garment should know *how* to care for it, to reap the most in service and satisfaction. It is well known that wool must be laundered in certain ways and with certain soaps to avoid shrinking. It is also known that hot water and a hot iron are enemies to silk. But the characteristics of rayon are not so well understood (page 35).

No water is too hot or too cold for rayon, and it will withstand strong soaps better than either silk or wool, but *it must not be handled roughly while wet*. When dry again, rayon regains its full original strength, but it lacks the water-resisting qualities of other fibers (page 36).

As nearly all rayon is fast dyed, there is little danger of harming the colors in washing, but a knitted rayon garment *should not be hung up to dry* (page 36).

All fabrics that combine rayon with other fibers should be given the treatment ordinarily accorded to the other fiber, as rayon lends itself to the requirements of silk, wool, or cotton.

Garments made of cotton and rayon will launder like all-cotton. Rayon can be placed in water of any temperature. It will take starch, and *it will not turn yellow*.

Any rayon garment can be dry cleaned with gasoline or other compounds used for silks or other fine fabrics, and if treated with the same care as silk, it will give entire satisfaction (page 37).

Interesting Points in the Adaptability of Rayon

ITS MANY USES AND FORMS

RAYON is finding as many uses in the scheme of things as any of the other fibers. In fact, it is our most versatile fiber, and is equally serviceable in the home, in evening apparel, in sports wear and in underwear (page 29).

The most commonly recognized form of rayon is the knitted fabric used in sweaters, scarfs, women's underwear, hosiery, etc.

It has been in general use for years in many other forms, not commonly known as rayon. Among the most noteworthy of these are silk-and-rayon brocades and tapestries, wherein the lustrous figure work is rayon (page 30).

Rayon has also found its way into many of the finest dress materials used, often accounting for the lustrous sheen of fine silks.

Woolen materials are using rayon for decorative stripes and patterns, and the popular knitted sports dresses and suits are almost exclusively of rayon (page 31).

In many figured voiles, mulls and other cotton materials, rayon is evident in the silky stripes and patterns (page 31).

Fabrics and garments made of rayon are of many different qualities, as is the case with other fibers. The better grades of rayon garments are as desirable and dependable as other good materials, when appropriately used and properly treated.

One of the best recommendations of rayon is its acceptance by other textile industries. Its worthiness could not be better established than by its combination with silk and wool and cotton in diversified materials.

Rayon is now the third largest textile industry, and it is growing by leaps and bounds. The amount of rayon used in underwear in 1923 was twenty-one times that used in 1912, and the knit goods industry consumed in 1923 fifty-two times its own record in 1912 (page 20).

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